MALABO MONTPELLIER PANEL

Kenya

WATER-WISE

Smart Irrigation Strategies for Africa

In 2010, Kenya had an estimated total area equipped for irrigation of 150,570 hectares (ha).[1] Although the 2018 Biennial Review Report by the African Union revealed that Kenya is not on track to meet Malabo Commitment area #3.1, "Access to agriculture inputs and technologies," given its score of 5.43 out of 10, which falls just below the 2017 minimum score of 5.53, the score reflects good progress.[2] According to data on three-year averages, Kenya increased the area under irrigation by about 37 percent between 2002/2004 and 2012/2014. Currently, the share of arable land equipped for irrigation accounts for just 2.6 percent.[3] **The economic potential for both large- and small-scale irrigation is very high, with an internal rate of return of approximately 7 percent and 40 percent, respectively, and the potential to bring 0.3 million ha and 0.05 million ha under irrigation.[4]**

INSTITUTIONAL INNOVATIONS

The majority of Kenya's irrigation schemes prior to independence were based on traditional systems, although there were some state-owned schemes too. By 1963, Kenya had developed a total of 2,500 ha for irrigation. Between 1963 and 1980, the focus was on expanding existing schemes and developing new, smaller schemes with support from development partners. As such, the National Irrigation Board (NIB) was formed in 1966 to manage public irrigation and private community-based schemes.[5]

Between 1978 and 1983 the emphasis continued to be on small-scale, farmer-managed irrigation, but out of the 6,700 ha initially projected, only 2,500 ha were equipped by 1989. Since the 1990s, export of horticultural crops has been the main driver for irrigation development.[6]

Over the years, responsibility for irrigation has been within the Ministry of Water, which has itself undergone several mergers and de-mergers with other ministries.[7] Currently, the responsibility for water management lies with the Ministry of Agriculture, Livestock, Fisheries and Irrigation, replacing the former Ministry of Water and Irrigation. Under this Ministry, the Irrigation and Drainage Directorate (IDD) is responsible for the overall coordination of irrigation activities, specifically for the development of smallholder irrigation. Prior to the 2010 Constitution, the IDD was responsible for policy and planning, while the NIB was responsible for implementation on the ground. However, the 2010 Constitution devolved both planning and implementation to local counties, at least for the projects they finance.[8]

At the national level the Water Resources Authority (WRA), formerly the Water Resources Management Authority (WRMA), is responsible for the allocation of water and delivery of water permits for various needs, including agriculture. The WRA delivers water permits only after ecological and basic human needs, international treaties and interbasin water transfers, and reserve and domestic water demands have been met.[9]

At subnational level, the six Regional Development Authorities (RDAs), based on the main river basins of the country, plan, coordinate, and promote investment for integrated natural resource use, including irrigation projects. Duplication of functions thus arises between the Ministry of Agriculture, Livestock, Fisheries and Irrigation and the IDD, NIB, and RDAs.[10]

Further, the Kenya Agricultural and Livestock Research Organization (KALRO), formerly the Kenya Agricultural Research Institute (KARI) and the Tegemeo Institute at Egerton University lead on irrigation research.[11]

In 2017, the government issued an Irrigation Bill, intended to set up a national irrigation development authority, to be run by a private company. The authority will be responsible for developing and improving irrigation infrastructure, providing irrigation services to private, medium-scale, and smallholder schemes, and for technical advisory services during the development of irrigation schemes.[12]

This is supported by President Uhuru Kenyatta's Big Four Initiative, announced in late 2017. As one of four main priorities, it includes one pillar on Food Security and Nutrition with the need to form an Agriculture and Irrigation Sector Working Group (AISWAG) to provide coordination for irrigation projects enhancing large-scale, commercial production.[13]

POLICY AND PROGRAMMATIC INTERVENTIONS

In 2008, Vision 2030 was launched by the government and is the long-term development blueprint for the country.[14] Several other policies and plans have been linked to Vision 2030, such as the Agricultural Sector Development Strategy 2009–2020 (ASDS). Within the ASDS the water and irrigation subsector aims to address the following intervention strategies:

- Finalization and implementation of the national irrigation policy and legal framework, including an increase in the government's financial allocation to irrigation of at least 2 percent of gross domestic product annually;
- Intensification and expansion of irrigation through a multisectoral approach and establishment of public-private partnerships with the aim to develop 32,000 ha of existing irrigated land per year and 704,000 ha of new irrigation areas by 2030;
- Improvement of rainwater harvesting and storage for agriculture, with an increase from 184 million cubic meters (m^3) to 25 billion m^3;
- Rehabilitation and protection of water catchments; and
- Implementation of the irrigation flagship projects, including the schemes in Bura, Hola, Ahero, West Kano, Bunyala, Perkerra, Kerio Valley, Mwea, Taita Taveta, Ewaso Nyiro North, and Ngurumani.[15]

In 2014, one of the government's flagship irrigation development projects, the "Galana Kulalu Food Security Project" run by the NIB, was initiated with the aim to reduce the price of maize. The contract for the project was awarded to Green Arava Ltd, with funding by the Government of Kenya. The project seeks to develop infrastructure for viable and economic utilization of natural resources, including water storage, water conveyance and distribution, irrigation, livestock production, and aquaculture.

The first phase of implementation comprises a 4,000 ha model farm that will be entirely self-sufficient. Phase two is followed by expansion to over 160,000 ha of farms that should replicate the outcomes of the model farm.[16] Fertilization and filtration will be available for all irrigation systems to optimize crop yields. At the operational center of the model farm, maize mills will be constructed, including storage silos and a packing house for vegetables with cooling rooms for storage. An electrical workshop, locksmith, and garage will be installed, and trainings will be made available to farm employees.[17]

Besides the irrigation component NIB has scheduled other activities, including construction of roads and community irrigation projects. In 2018 the NIB handed over about 8,000 ha of total area to private firms and the Agricultural Development Corporation (ADC) to plant and mill more maize.[18]

Smart irrigation technologies

In 2016, Kenya's Meru University of Science and Technology developed a "sensor-based automatic irrigation system" app that monitors the need for water in fields and controls irrigation equipment. The app makes use of sensors placed in a field to determine the soil's moisture. If it is too dry, a control unit uses solar panels to open the valve of a water tank and closes it again when the soil is damp enough. The upfront costs are rather high – US$480 per 0.1 ha for a combined app and irrigation system, including solar panels and two drip irrigation lines. The system can be expanded to an additional 0.1 ha for US$48.[19]

The US company SunCulture, based in Nairobi, has been selling solar irrigation kits to Kenyan smallholder farmers since 2013. The SunCulture AgroSolar irrigation system combines the energy efficiency of solar power with the effectiveness of drip irrigation. Solar panels provide the pump's electricity without the need for batteries or inverters. Water is pumped into a raised water storage tank during the day. During the evening, the irrigation takes place and a valve on the water tank is opened; using gravity, water flows down through a filtration system onto the crop root zones via the irrigation tape. The kit costs US$2,500, including the solar pumping system, drip irrigation equipment for 0.4 ha, and training on how to operate the system. According to experience, farmers can increase their yields by 300 percent or more and save over US$10,000 per year compared to using petrol or furrow systems.[20]

KickStart, an international company headquartered in Kenya and operating in 17 African countries, markets two different types of pumps – a treadle pump and a hip pump. The hip pump is the smaller version, weighing 4.5 kilograms (kg), whereas the treadle pump weighs 16 kg. Both pumping systems have the capacity to pump water from a depth of 7 meters, a maximum pumping height of 14 meters, and an overall push distance of 200 meters on flat ground. The hip pump irrigates up to 0.5 ha of land per day, while the treadle pump can irrigate up to 0.8 ha per day. The pumps and spare parts are sold through agrodealers. Costs for the larger treadle pump range between US$150–250, while the hip pump is sold for around US$50. For most farmers, this is still beyond reach. KickStart is currently in the process of developing financing options and microcredits. By September 2018, about 327,000 pumps had been sold.[21]

Furthermore, a project co-financed by the Green Climate Fund, KawiSafi Ventures, Acumen Fund, and other investors aims to create an investment fund to drive off-grid solar power in Kenya and East Africa. Investments totalling US$110 million are scheduled

to develop 10 to 15 alternative energy small- and medium-sized enterprises. Solar power can be useful for various agriculture-related activities. Examples include solar-powered irrigation pumps and power for small businesses such as rice processors. The project estimates that savings for households can range from approximately US$75 to US$200 per year, depending on the daily cost of kerosene, the amount of kerosene displaced, and the cost of the solar system in the specific geographic market. Further, more powerful solar home systems have the ability to power micro and small business to increase income for consumers and can be used for agricultural inventions. Solar-powered irrigation pumps and refrigeration can increase farmers' yields and ultimately income.[22] One of the few companies selling solar home systems is the British company Sollatek, which has been operating in Kenya since 1985, selling its products through a regionwide network of distributors. Besides a range of domestic solar systems, like lamps and solar panels, Sollatek sells solar water pumps as well as solar refrigerators and freezers.[23] Over the last ten years, Kenya has significantly increased the area under irrigation, largely due to strong policy innovations and programmatic interventions as well as an active role of the private sector in the dissemination of smart irrigation technologies. However, the potential to expand the share of arable land remains high.

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